

- 
- **EM efficiencies** (parameterized & sideband subtracted)
  - **Z mass window tuning**
  - **Summary & Plans**

# Samples

---

## → Data:

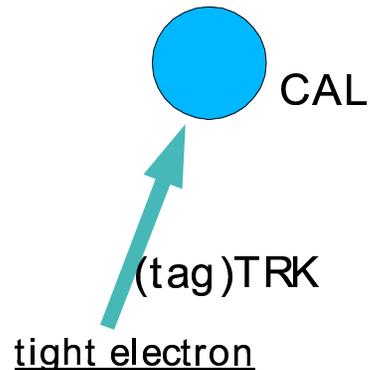
- EM1TRK skim
- Single EM triggers
- Run range: 20 April 2002 - 28 June 2004 (Runs 151,817 - 194,566)
- Rejecting bad runs (CAL, SMT, CFT, Jet/Met, Lumi)
- 323pb-1
- No t42 applied
- Processed with ATHENA (v01-05-02)

## → MC:

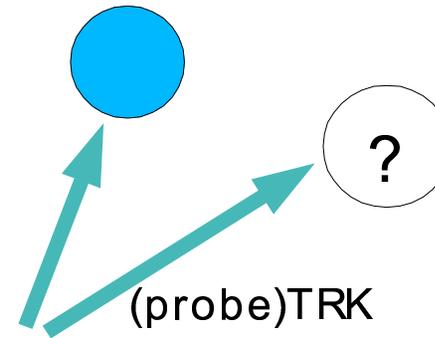
- $Z/\gamma^* \rightarrow e^+e^-+X$
- Pythia
- 400k events
- Request IDs: 12018, 12028, 12029, 12030
- Processed with ATHENA (v01-05-02)

# Tag & Probe Method

Tag:



Probe:



## Z(ee) + n Jets Analysis Cuts:

PVX < 60cm

**Tag-Electron:** EMF > 0.9, Iso < 0.15, HMx7 < 12.,  $p_T > 25$  GeV,  $|\eta| < 1.1$ , **with** phi cracks,  
matched with a good track in  $\Delta R(<0.14)$

**Trigger:** tag electron is required to have fired single electron trigger

**Tag & ProbeTracks:**  $25 \text{ GeV} < p_T < 80 \text{ GeV}$ ,  $\text{Chi}2 < 8.0$ ,  $|\text{DCA}0| < 0.3$ ,  $|\text{DCA}1| < 4.0$ ,  $|\eta| < 1.1$ , **with** phi cracks

**Probe:** Good track separated from Tag by  $\Delta\Phi > 2.0$

**Background reduction:** opposite signed tracks, MET < 15 GeV, Sidebands

**TagElec-ProbeTrack-invmass cut:**  $70 \text{ GeV} < M_{ee} < 110 \text{ GeV}$

**Reco matching cone:**  $dR = \text{SQRT}(\Delta\eta^2 + \Delta\Phi^2) = \text{SQRT}(.1^2 + .1^2) = 0.14$

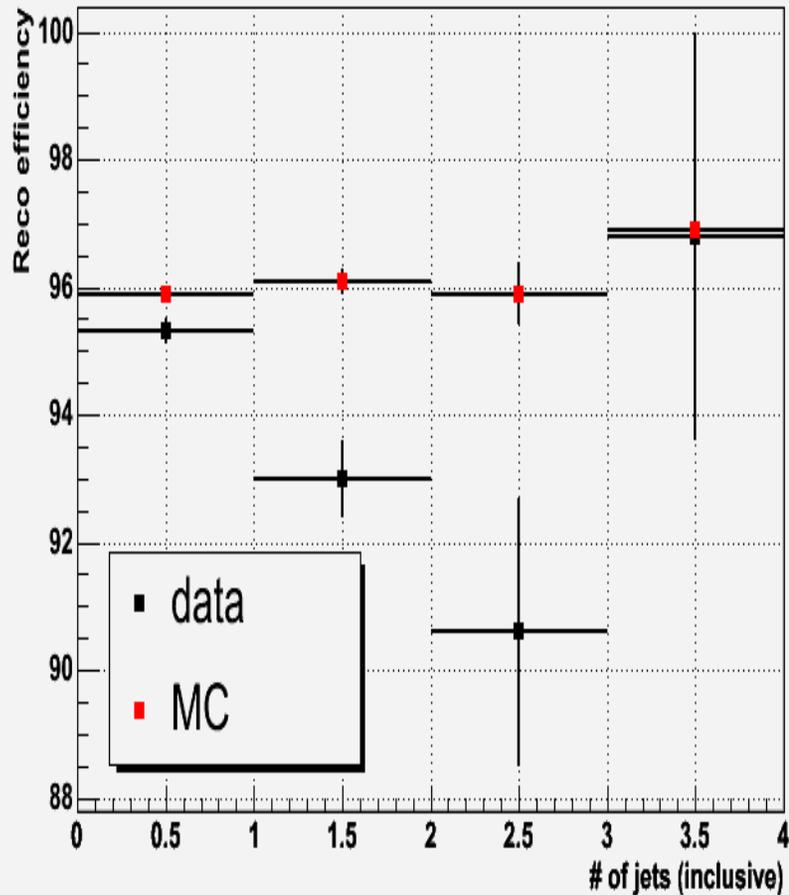
**Jets:**  $0.05 < \text{EMF} < 0.95$ , HotF < 10.0, N90 > 1, CHF < 0.4, L1conf,  $p_T > 20.$ ,  $|\text{eta}| < 2.5$ , **not counting jets**

**overlapping with probe tracks within  $\Delta R < 0.4$**

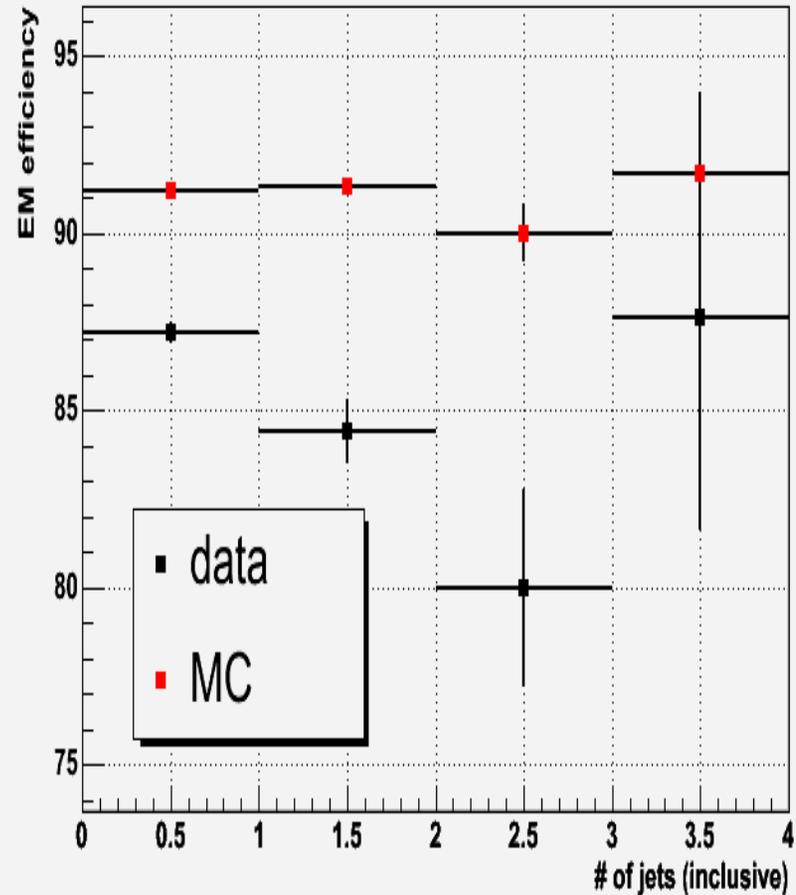


# Averaged Reco/EM Efficiencies vs Jet Multiplicity

Data vs MC: Reco efficiencies vs Jet Multiplicity



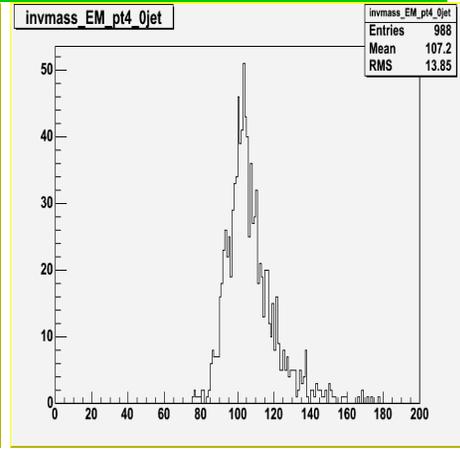
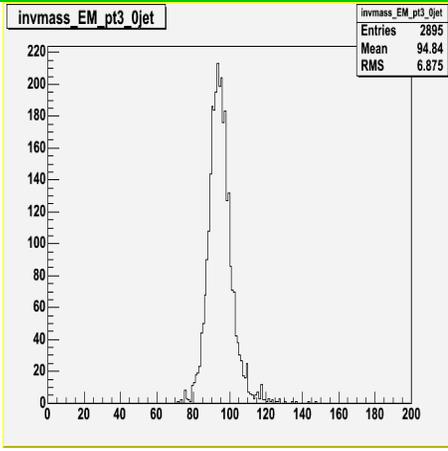
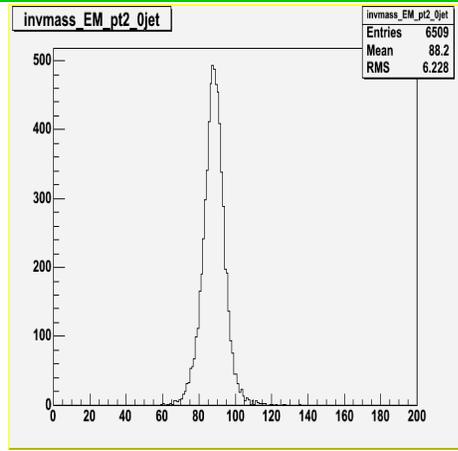
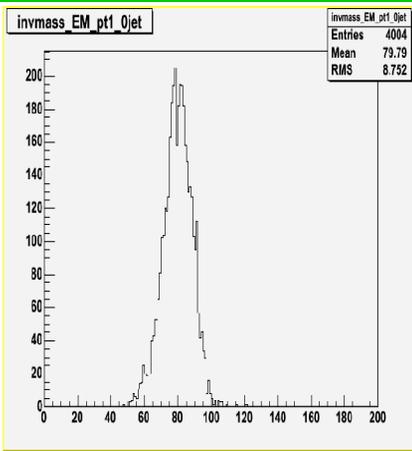
Data vs MC: EM efficiencies vs Jet Multiplicity



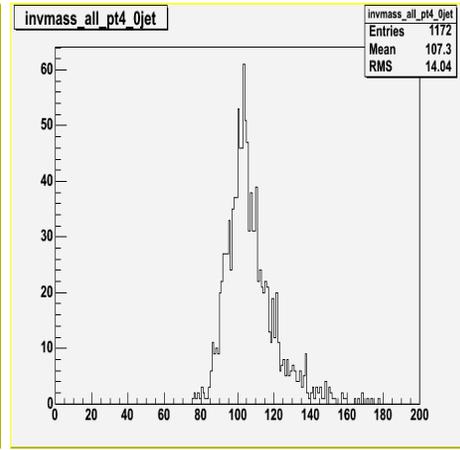
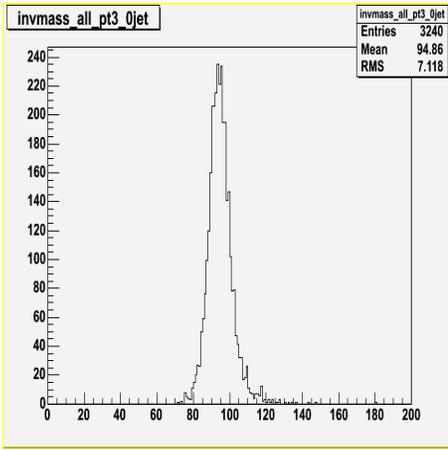
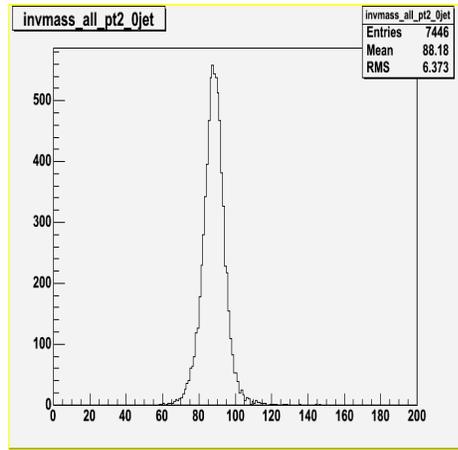
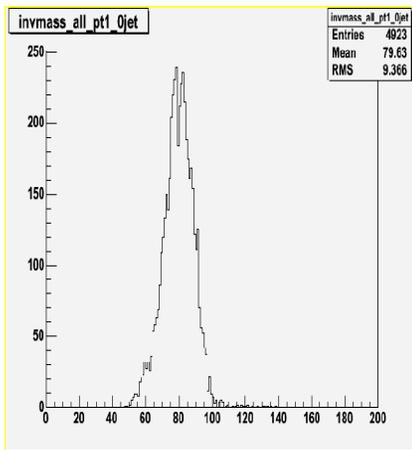
Using averaged efficiencies for  $\geq 1, 2, 3 \dots$  jets

# Parameterized Efficiencies ( $\geq 0$ jets): pt, data

Numerator



Denominator



25GeV-35GeV:

Eff =  $(82.7 \pm 0.6)\%$

(SB1:40-60, SB2:100-120)

35GeV-45GeV:

Eff =  $(87.7 \pm 0.4)\%$

(SB1:50-75, SB2:105-130)

45GeV-55GeV:

Eff =  $(90.1 \pm 0.6)\%$

(SB1:60-85, SB2:105-130)

>55GeV:

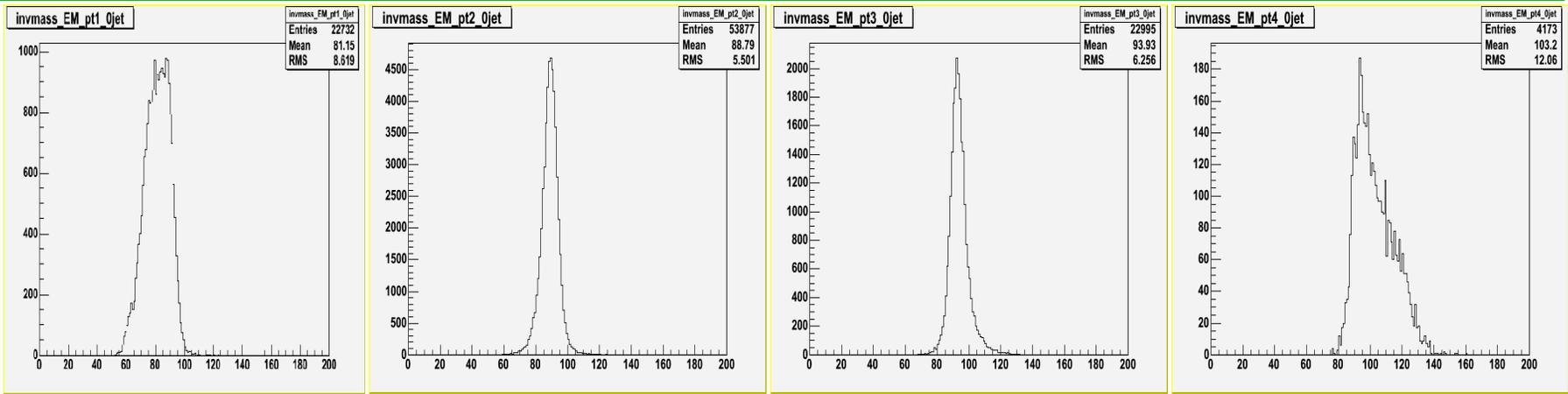
Eff =  $(85.8 \pm 1.1)\%$

(SB1:60-90, SB2:130-180)

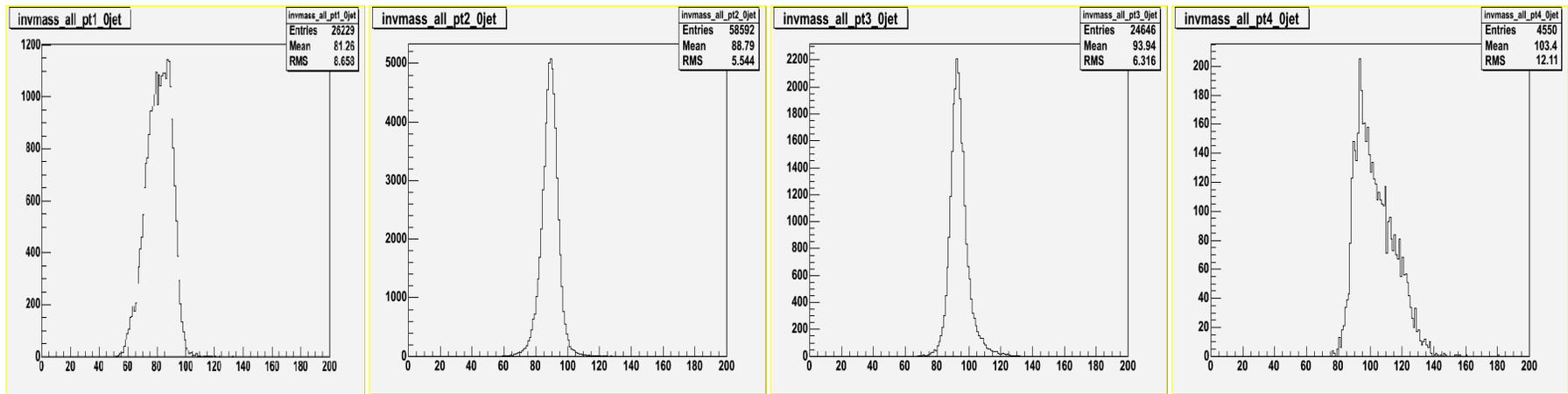


# Parameterized Efficiencies ( $\geq 0$ jets): pt, MC

Numerator



Denominator



25GeV-35GeV:

Eff = (86.8 $\pm$ 0.2)%

(SB1:40-60, SB2:100-120)

35GeV-45GeV:

Eff = (92.1 $\pm$ 0.1)%

(SB1:50-75, SB2:105-130)

45GeV-55GeV:

Eff = (93.5 $\pm$ 0.2)%

(SB1:60-85, SB2:105-130)

>55GeV:

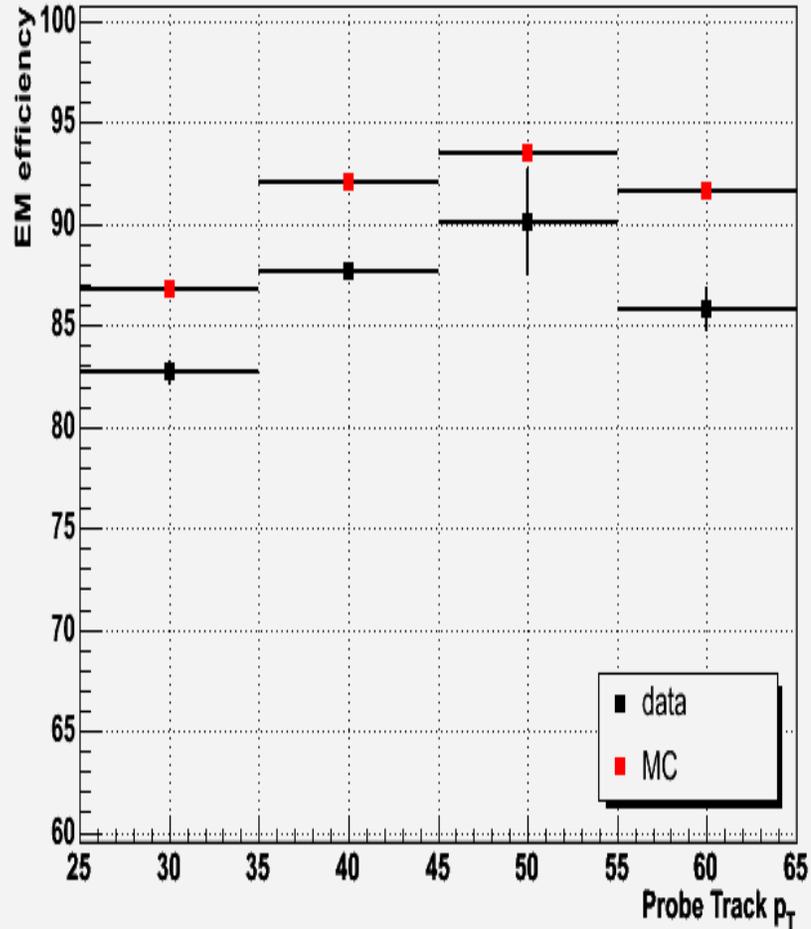
Eff = (91.6 $\pm$ 0.4)%

(SB1:60-90, SB2:130-180)

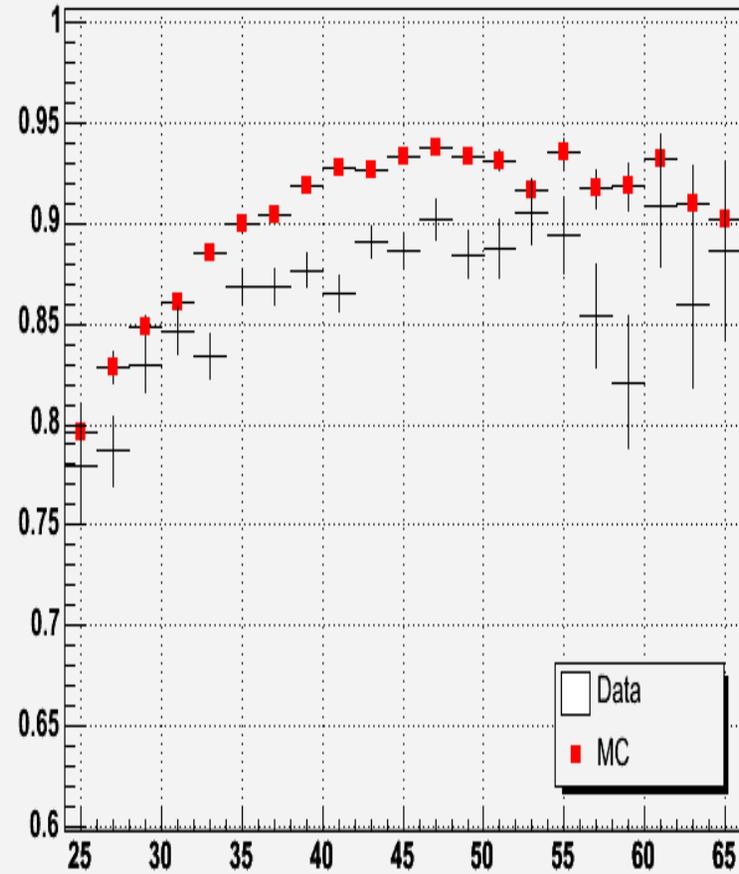


# Parameterized Efficiencies ( $\geq 0$ jets): pt summary

Data vs MC: EM efficiencies vs pT (SB subtracted)

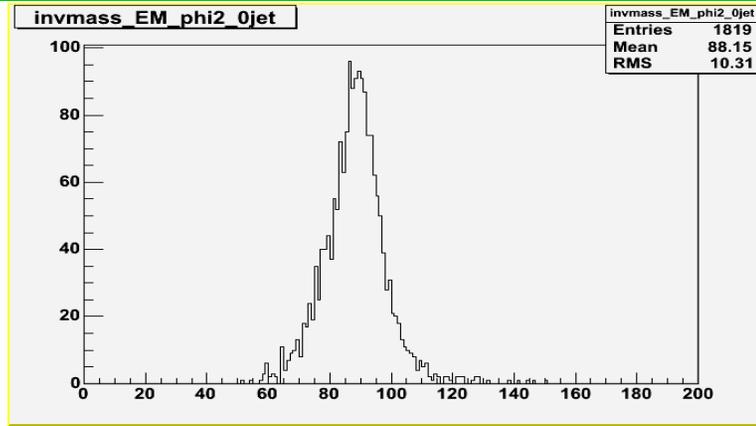
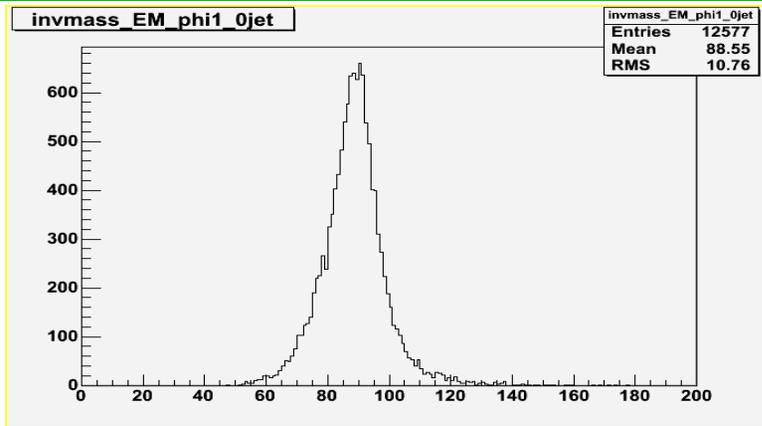


eff\_EM\_pt\_0jet (no SB subtraction)

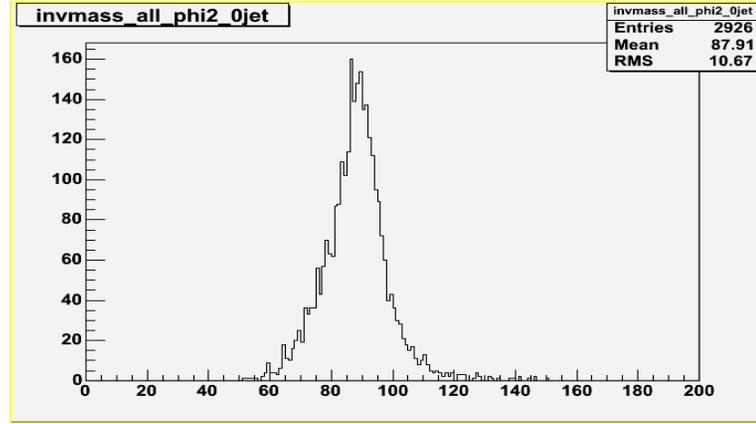
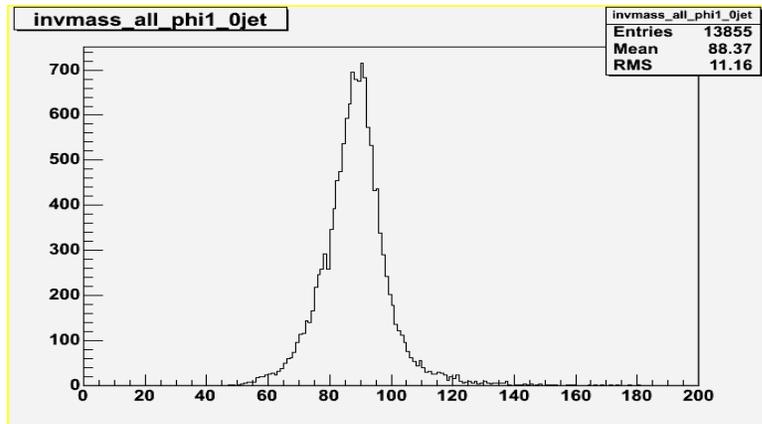


# Parameterized Efficiencies ( $\geq 0$ jets): phi, data

Numerator



Denominator



'flat region':

$$\text{Eff} = (91.9 \pm 0.2)\%$$

(SB1:40-65, SB2:115-140)

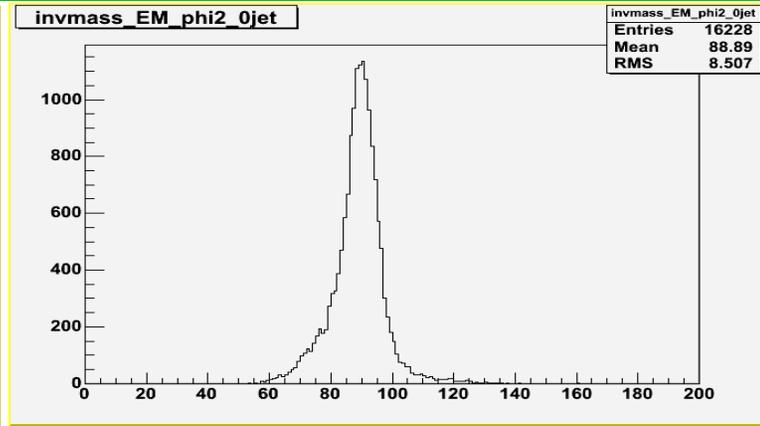
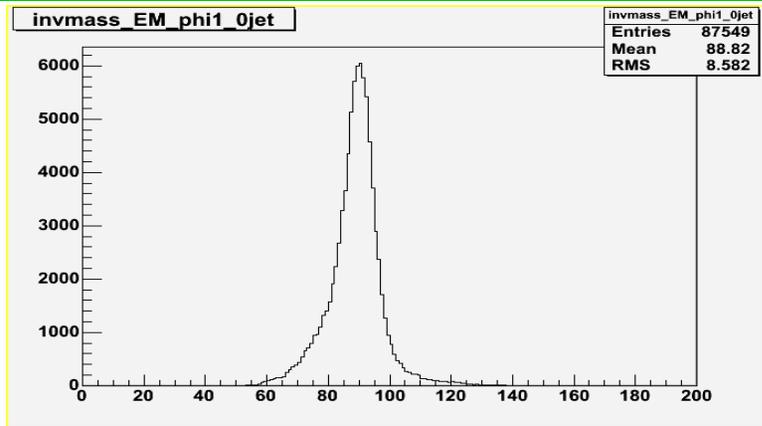
Phi cracks:

$$\text{Eff} = (63.5 \pm 0.9)\%$$

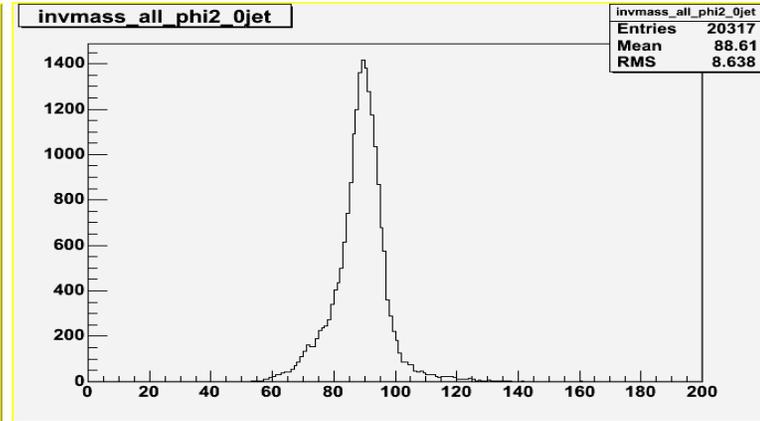
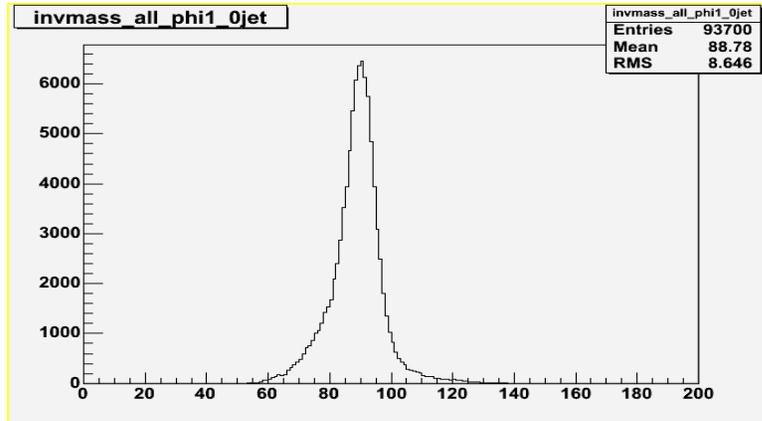
(SB1:40-70, SB2:110-140)

# Parameterized Efficiencies ( $\geq 0$ jets): phi, MC

Numerator



Denominator



'flat region':

$$\text{Eff} = (93.5 \pm 0.1)\%$$

(SB1:40-65, SB2:115-140)

Phi cracks:

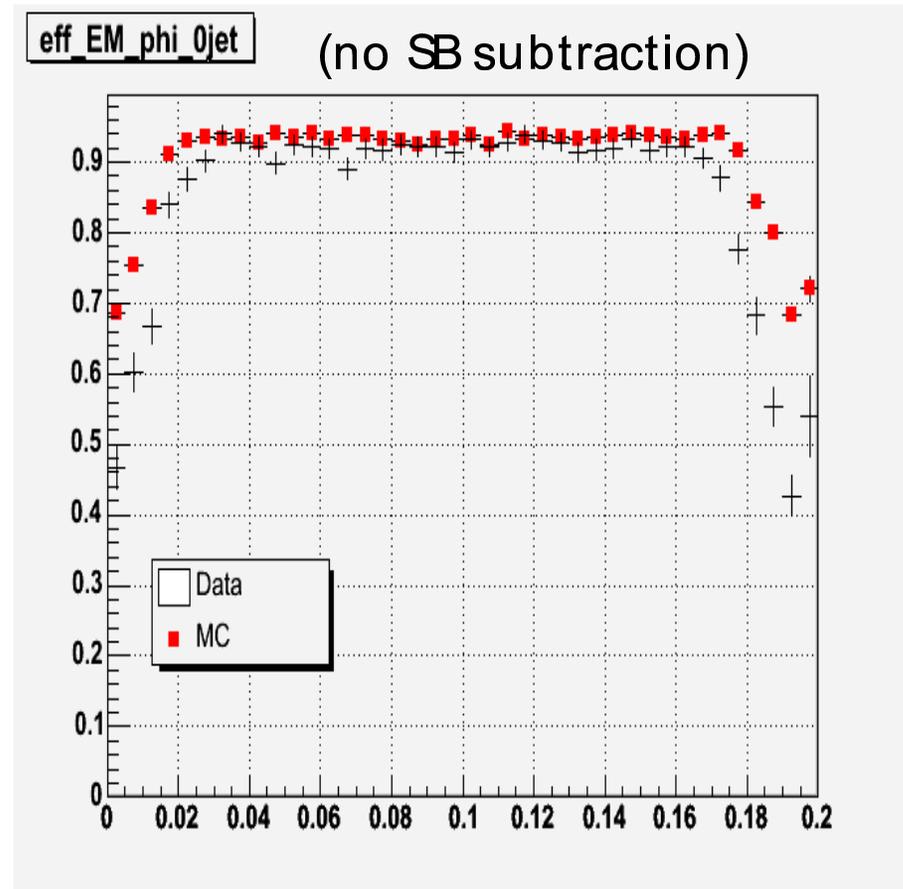
$$\text{Eff} = (80.3 \pm 0.3)\%$$

(SB1:40-70, SB2:110-140)

# Parameterized Efficiencies ( $\geq 0$ jets): phi summary

SB subtracted:

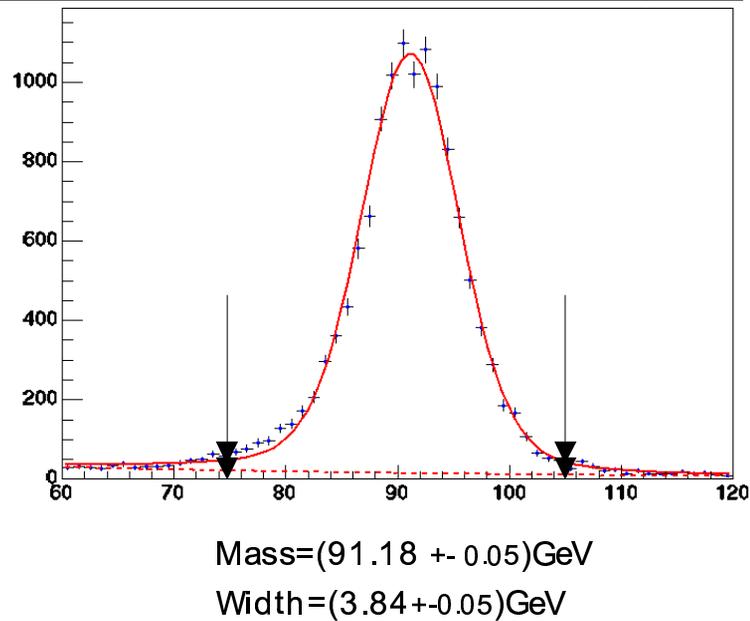
	data	MC
'Flat region'	91.9 $\pm$ 0.2	93.5 $\pm$ 0.1
Phi cracks	63.5 $\pm$ 0.9	80.3 $\pm$ 0.3



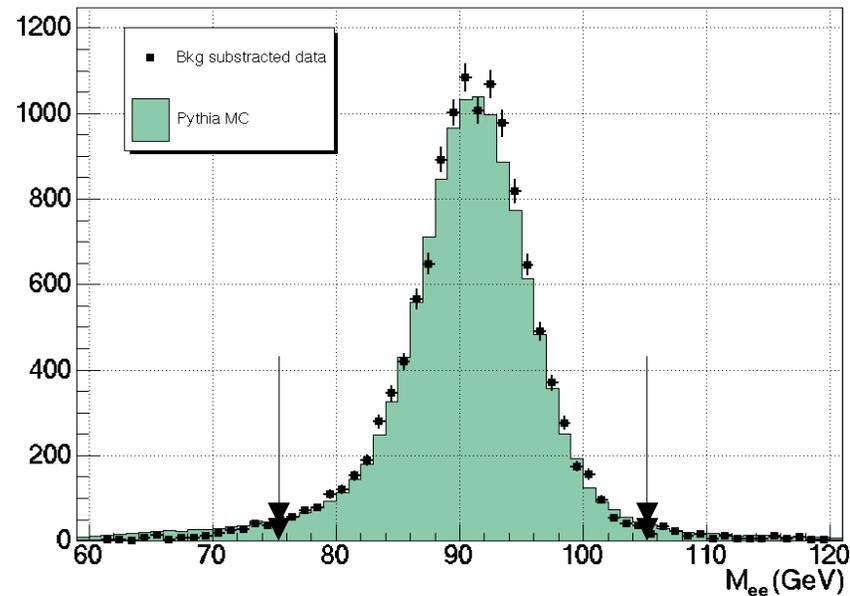
# $M_{ee}$ Mass Window Tuning ( $\geq 0$ Jets)

Mass Window [GeV]	80-100	75-105	76-106
DY fraction (MC)	1.6%	2.3%	2.2%
S = Z + DY	11,697	12,550	12,504
B = QCD	119	167	171
S/sqrt(B)	1,070	970	957

diem invariant mass (1 track,  $\geq 0$  jets)



diem invariant mass (1 track,  $\geq 0$  jets)



# Summary & Plans

---

- Converging on final numbers for correction factors (EM, Tracking, Trigger)
- Signal region:  $75\text{GeV} < M_{ee} < 105\text{GeV}$
- Next:
  - Acceptance vs Jet Multiplicity
  - Data vs MC comparisons
- Analysis note in preparation